CLAIMS

1. A powder mixing microchip, comprising:
a powder mixing unit for mixing a plurality of powder components to provide a powder mixture, the powder mixing unit including a powder mixing channel in which powder components are mixed on being transported therethrough, a powder outlet port through which the powder mixture is delivered, and a plurality of mixing gas supply channels fluidly connected to the powder mixing channel at spaced locations along a length thereof through which mixing gas flows are delivered to effect mixing of the powder components on being transported through the powder mixing channel.

2. The microchip of claim 1, wherein the powder mixing channel is an elongate, linear conduit.

3. The microchip of claim 1, wherein the powder mixing channel comprises a series of mixing chambers interconnected by respective interconnecting conduits of smaller dimension, with the mixing gas supply channels being fluidly connected to the mixing chambers.

4. The microchip of claim 3, wherein the interconnecting conduits are configured such that inlets and outlets of the mixing chambers are not in opposing relation.

5. The microchip of any of claims 1 to 4, wherein the mixing gas supply channels are configured such as to provide a gas cushion which supports powder components transported through the powder mixing channel.

6. The microchip of any of claims 1 to 5, wherein the mixing gas supply channels are configured such as to provide turbulent gas flows in the powder mixing channel.

7. The microchip of any of claims 1 to 6, wherein the mixing gas supply channels are equi-spaced.

8. The microchip of any of claims 1 to 7, wherein the powder mixing unit includes first and second groups of mixing gas supply channels fluidly connected to respective ones of opposed sides of the powder mixing channel.

9. The microchip of claim 8, wherein the first and second groups of mixing gas supply channels are in opposed relation.

10. The microchip of claim 9, wherein the first and second groups of mixing gas supply channels are at a bottom of the powder mixing channel.

11. The microchip of claim 9, wherein the first and second groups of mixing gas supply channels are at a top of the powder mixing channel.

12. The microchip of claim 8, wherein the first and second groups of mixing gas supply channels are located at respective ones of a top and a bottom of the powder mixing channel.

13. The microchip of any of claims 1 to 7, wherein the powder mixing unit includes first and second groups of mixing gas supply channels fluidly connected to one side of the powder mixing channel.

14. The microchip of claim 13, wherein the first and second groups of mixing gas supply channels are located at respective ones of a top and a bottom of the powder mixing channel.

15. The microchip of any of claims 1 to 7, wherein the powder mixing unit includes first and second groups of mixing gas supply channels fluidly connected to each of respective ones of opposed sides of the powder mixing channel.

16. The microchip of claim 15, wherein the first and second groups of mixing gas supply channels connected to each of the respective sides of the powder mixing channel are located at respective ones of a top and a bottom of the powder mixing channel.

17. The microchip of any of claims 8 to 16, wherein each respective group of mixing gas supply channels is fluidly connected by a manifold.

18. The microchip of any of claims 1 to 17, further comprising:
at least one powder delivery unit for delivering a plurality of powder components to the powder mixing channel.

19. The microchip of claim 18, comprising:
a plurality of powder delivery units for delivering a plurality of powder components to the powder mixing channel.

20. The microchip of claim 18 or 19, wherein each powder delivery unit includes a powder delivery channel fluidly connected to the powder mixing channel and through which at least one powder component is delivered to the powder mixing channel, at least one powder inlet port through which at least one powder component is supplied to the powder delivery channel, and a plurality of delivery gas supply channels fluidly connected to the powder delivery channel at spaced locations along a length thereof through which delivery gas flows are delivered at least in part to transport the at least one powder component to the powder mixing channel.

21. The microchip of claim 20, wherein the powder delivery channel is an elongate, linear conduit.

22. The microchip of claim 20 or 21, wherein the delivery gas supply channels are configured such as to provide a gas cushion which supports the at least one powder component transported through the powder delivery channel.

23. The microchip of any of claims 20 to 22, wherein the delivery gas supply channels are configured such as to provide turbulent gas flows in the powder delivery channel.

24. The microchip of any of claims 20 to 23, wherein the delivery gas supply channels are equi-spaced.

25. The microchip of any of claims 20 to 24, wherein each powder delivery unit includes first and second groups of delivery gas supply channels fluidly connected to respective ones of opposed sides of the powder delivery channel.

26. The microchip of claim 25, wherein the first and second groups of delivery gas supply channels are in opposed relation.

27. The microchip of claim 26, wherein the first and second groups of delivery gas supply channels are at a bottom of the powder delivery channel.

28. The microchip of claim 26, wherein the first and second groups of delivery gas supply channels are at a top of the powder delivery channel.

29. The microchip of claim 25, wherein the first and second groups of delivery gas supply channels are located at respective ones of a top and a bottom of the powder delivery channel.

30. The microchip of any of claims 20 to 24, wherein each powder delivery unit includes first and second groups of delivery gas supply channels fluidly connected to one side of the powder delivery channel.

31. The microchip of claim 30, wherein the first and second groups of delivery gas supply channels are located at respective ones of a top and a bottom of the powder delivery channel.

32. The microchip of any of claims 20 to 24, wherein each powder delivery unit includes first and second groups of delivery gas supply channels fluidly connected to each of respective ones of opposed sides of the powder delivery channel.

33. The microchip of claim 32, wherein the first and second groups of delivery gas supply channels connected to each of the respective sides of the powder delivery channel are located at respective ones of a top and a bottom of the powder delivery channel.

34. The microchip of any of claims 20 to 33, wherein each respective group of delivery gas supply channels is fluidly connected by a manifold.

35. The microchip of any of claims 20 to 34 when appendant upon claim 19, wherein each powder delivery unit includes a single powder inlet port.

36. The microchip of any of claims 20 to 34, wherein at least one powder delivery unit includes a plurality of powder inlet ports.

37. The microchip of any of claims 20 to 36, wherein each powder delivery unit includes a transport gas supply channel fluidly connected to the powder delivery channel for delivering a transport gas flow, separate to the delivery gas flows, through the powder delivery channel, which transport gas flow acts at least in part to transport the at least one powder component to the powder mixing channel.

38. A powder mixing system, comprising:
the microchip of any of claims 1 to 37.

39. The system of claim 38, further comprising:
a plurality of powder supply units fluidly connected to respective ones of the powder inlet ports for supplying respective ones of the powder components.

40. The system of claim 38 or 39, further comprising:
at least one gas supply unit operably fluidly connected to the mixing gas supply channels to supply a pressurized gas thereto.

41. The system of claim 40 when appendant upon claim 20, wherein the at least one gas supply unit is operably fluidly connected to the delivery gas supply channels to supply a pressurized gas thereto.

42. The system of claim 40 when appendant upon claims 19 and 34, wherein the at least one gas supply unit is operably fluidly connected to the manifolds such as to enable control of relative flow rates of the delivery gas flows in the powder delivery channels of the respective powder delivery units, whereby delivery rates of powder components delivered by respective ones of the powder delivery units can be controlled such as to enable control of a mixing ratio of the powder mixture.

43. The system of claim 40 when appendant upon claims 19 and 37, wherein the at least one gas supply unit is operably fluidly connected to the transport gas supply channels such as to enable control of relative flow rates of the transport gas flows in the powder delivery channels of the respective powder delivery units, whereby delivery rates of powder components delivered by respective ones of the powder delivery units can be controlled such as to enable control of a mixing ratio of the powder mixture.

44. A powder mixing method, comprising the steps of:
providing a powder mixing microchip comprising: a powder mixing unit for mixing a plurality of powder components to provide a powder mixture, the powder mixing unit including a powder mixing channel in which powder components are mixed on being transported therethrough;
delivering a plurality of powder components to the powder mixing channel; and

delivering a plurality of mixing gas flows to the powder mixing channel at spaced locations along a length thereof, which mixing gas flows act to mix the powder components during transport through the powder mixing channel.

45. The method of claim 44, wherein the mixing gas flows are such as to provide a gas cushion which supports powder components transported through the powder mixing channel.

46. The method of claim 44 or 45, wherein the mixing gas flows are such as to provide turbulent gas flows in the powder mixing channel.

47. The method of any of claims 44 to 46, comprising the step of:
delivering first and second groups of mixing gas flows to the powder mixing channel from respective ones of opposed sides thereof.

48. The method of claim 47, wherein the first and second groups of mixing gas flows are in opposed relation.

49. The method of claim 48, wherein the first and second groups of mixing gas flows are from a bottom of the powder mixing channel.

50. The method of claim 48, wherein the first and second groups of mixing gas flows are from a top of the powder mixing channel.

51. The method of claim 47, wherein the first and second groups of mixing gas flows are from respective ones of a top and a bottom of the powder mixing channel.

52. The method of any of claims 44 to 46, comprising the step of:
delivering first and second groups of mixing gas flows to the powder mixing channel from one side of the powder mixing channel.

53. The method of claim 52, wherein the first and second groups of mixing gas flows are from respective ones of a top and a bottom of the powder mixing channel.

54. The method of any of claims 44 to 46, comprising the step of:
delivering first and second groups of mixing gas flows to the powder mixing channel from each of respective ones of opposed sides of the powder mixing channel.

55. The method of claim 54, wherein the first and second groups of mixing gas flows from each of the respective sides of the powder mixing channel are from respective ones of a top and a bottom of the powder mixing channel.

56. The method of any of claims 44 to 55, wherein the powder mixing microchip further comprises: at least one powder delivery unit for delivering a plurality of powder components to the powder mixing channel, each powder delivery unit including a powder delivery channel fluidly connected to the powder mixing channel, and further comprising the step of:
delivering a plurality of delivery gas flows to the powder delivery channel at spaced locations along a length thereof, which delivery gas flows act at least in part to transport the at least one powder component to the powder mixing channel.

57. The method of claim 56, wherein the delivery gas flows are such as to provide a gas cushion which supports the at least one powder component transported through the powder delivery channel.

58. The method of claim 56 or 57, wherein the delivery gas flows are such as to provide turbulent gas flows in the powder delivery channel.

59. The method of any of claims 56 to 58, comprising the step of:
delivering first and second groups of delivery gas flows to the powder delivery channel from respective ones of opposed sides thereof.

60. The method of claim 59, wherein the first and second groups of delivery gas flows are in opposed relation.

61. The method of claim 60, wherein the first and second groups of delivery gas flows are from a bottom of the powder delivery channel.

62. The method of claim 60, wherein the first and second groups of delivery gas flows are from a top of the powder delivery channel.

63. The method of claim 59, wherein the first and second groups of delivery gas flows are from respective ones of a top and a bottom of the powder delivery channel.

64. The method of any of claims 56 to 58, comprising the step of:
delivering first and second groups of delivery gas flows to the powder delivery channel from one side of the powder delivery channel.

65. The method of claim 64, wherein the first and second groups of delivery gas flows are from respective ones of a top and a bottom of the powder delivery channel.

66. The method of any of claims 56 to 58, comprising the step of:
delivering first and second groups of delivery gas flows to the powder delivery channel from each of respective ones of opposed sides of the powder delivery channel.

67. The method of claim 66, wherein the first and second groups of delivery gas flows from each of the respective sides of the powder delivery channel are from respective ones of a top and a bottom of the powder delivery channel.

68. The method of any of claims 56 to 67, further comprising the step of:

delivering a transport gas flow, separate to the delivery gas flows, through the powder delivery channel, which transport gas flow acts at least in part to transport the at least one powder component to the powder mixing channel.

69. The method of any of claims 56 to 68, wherein the powder mixing microchip comprises: a plurality of powder delivery units for delivering a plurality of powder components to the powder mixing channel.

70. The method of claim 69 when appendant upon claim 56, further comprising the step of:
controlling relative flow rates of the delivery gas flows in the powder delivery channels of the respective powder delivery units such as to control delivery rates of powder components delivered by respective ones of the powder delivery units, and thereby enable control of a mixing ratio of the powder mixture.

71. The method of claim 69 or 70 when appendant upon claim 68, further comprising the step of:
controlling relative flow rates of the transport gas flows through the powder delivery channels of the respective powder delivery units such as to control delivery rates of powder components delivered by respective ones of the powder delivery units, and thereby enable control of a mixing ratio of the powder mixture.